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(54) Selective oxabicycloalkanes.

(57) This invention relates to compounds, agriculturally suitable compositions thereof, and a method for controlling the growth of undesired vegetation in paddy rice with an oxabicycloalkane herbicide of the formula
$JOCH_2Q$
wherein J is an oxabicycloalkane moiety; and
Q is an optionally substituted aromatic or heteroaromatic moiety.

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SELECTIVE OXABICYCLOALKANES

Background of the Invention

This invention relates to compounds, agriculturally suitable compositions thereof, and a method for controlling the growth of undesired vegetation in paddy rice with an oxabicycloalkane herbicide.

U.S. 4,670,041 and U.S. 4,486,219 disclose oxabicycloalkanes and their use for controlling plant growth.

U.S. 4,798,621 discloses [2.2.1]oxabicycloethers for the control of weeds in rice.

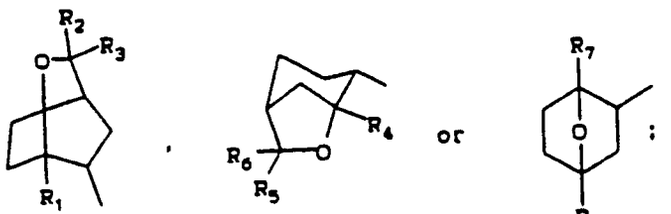
Summary of the Invention

This invention comprises a method for controlling the growth of undesired vegetation in a paddy rice crop by applying to the locus of the paddy rice crop an effective amount of a compound of Formula I

$JOCH_2Q$ Formula I

wherein

J is



J-1 J-2 J-3

R_1 is CH_3 or CH_2CH_3;

R_2 and R_3 are independently H, CH_3 or CH_2CH_3 or

R_2 and R_3 may be taken together as -(CH_2)n- where n is 4 or 5;

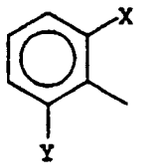
R_4 is H, CH_3 or CH_2CH_3;

R_5 and R_6 are independently CH_3 or CH_2CH_3;

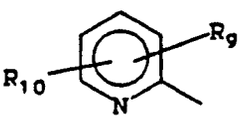
R_7 is CH_3 or CH_2CH_3;

R_8 is CH_3, CH_2CH_3 or $CH(CH_3)_2$;

Q is



Q-1



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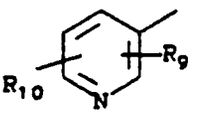

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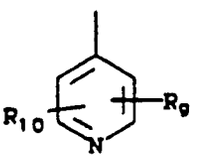
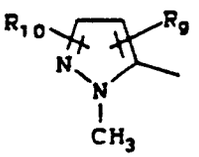
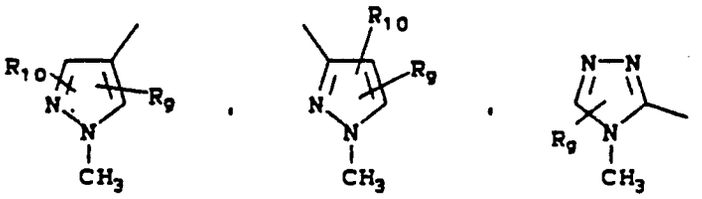


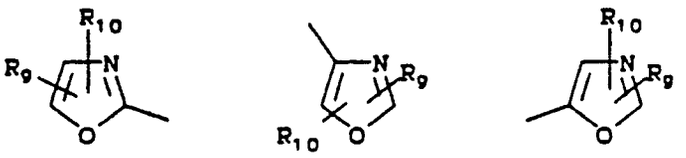
Q-4



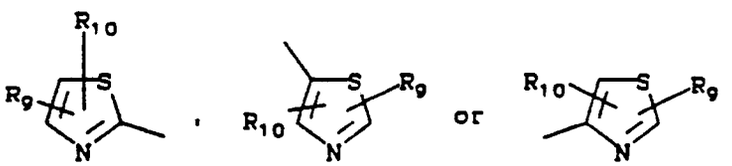
Q-5



Q-6 Q-7 Q-8



Q-9 Q-10 Q-11



Q-12 Q-13 Q-14

X is F, Cl, or CH_3;
Y is H, F, or Cl;
R_9 is H, F, Cl, Br, CH_3 or CH_2CH_3; and
R_{10} is H, F, Cl or CH_3;
provided that

1. when J is J-1 or J-3 and Q is Q-2 then R_9 and R_{10} are not both H.
2. when Q is Q-1 then J is J-1, R_1 is CH_3, and R_2 and R_3 are both CH_2CH_3.
3. when X is F then Y is other than H.
4. when X is Cl then Y is other than Cl.
5. when X is CH_3 then Y is H.
6. when Y is H then X is Cl or CH_3.
7. when Y is F then X is F or Cl.
8. when Y is Cl then X is F or H.

Preferred for reasons of more efficient weed control and/or better crop tolerance are:

1. The method wherein

R_1 is CH_3;
R_2 and R_3 are CH_2CH_3 or R_2 and R_3 are taken together as $-(CH_2)n-$ where n is 4 or 5;

R_4 is CH_3;
R_5 and R_6 are CH_3;
R_7 is CH_3 or CH_2CH_3; and
R_8 is CH_2CH_3 or $CH(CH_3)_2$.

2. The method of Preferred 1 wherein J is J-1.
3. The method of Preferred 2 wherein Q is Q-1.
4. The method of Preferred 2 wherein Q is Q-2.
5. The method of Preferred 2 wherein Q is Q-3 or Q-4.
6. The method of Preferred 2 wherein Q is Q-5 through Q-14.
7. The method of Preferred 1 wherein J is J-2.
8. The method of Preferred 7 wherein Q is Q-2.
9. The method of Preferred 7 wherein Q is Q-3 or Q-4.
10. The method of Preferred 7 wherein Q is Q-5 through Q-14.
11. The method of Preferred 1 wherein J is J-3.
12. The method of Preferred 12 wherein Q is Q-2.
13. The method of Preferred 12 wherein Q is Q-3.
14. The method of Preferred 12 wherein Q is Q-4.
15. The method of Preferred 12 wherein Q is Q-5 or Q-6.
16. The method of Preferred 12 wherein Q is Q-7 through Q-14.
17. The method of Preferred 1 wherein the crop is transplanted japonica rice.
18. The method of Preferred 1 wherein the crop is transplanted indica rice.
19. The method of Preferred 1 wherein among the weeds controlled is barnyardgrass.

Specifically preferred for reasons of most efficient weed control and/or better crop tolerance is the method wherein the compound of Formula I is selected from the group consisting of:
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane;
6-endo-[(2-chlorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo-[2.2.2]octane;
6-endo-[(2-chloro-6-fluoro phenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2.]octane;
3,3-diethyl-1-methyl-6-endo-[(2-methylphenyl)methoxy]-2-oxabicyclo[2.2.2]octane;
exo-1-methyl-4-(1-methylethyl)-2-[(4′-thiazolyl)methoxy]-7-oxabicyclo[2.2.1]heptane;
exo-1,4-diethyl-2-[(4′-thiazolyl)methoxy]-7-oxabicyclo[2.2.1]heptane;
exo-1-methyl-4-(1-methylethyl)-2-[(2′-(6′-fluoropyridyl))methoxy]-7-oxabicyclo[2.2.1]heptane; and
exo-1,4-diethyl-2-[(2′-(6′-fluoropyridyl))methoxy]-7-oxabicyclo[2.2.1]heptane.

This invention also comprises compounds of Formula I and agriculturally suitable compositions containing them wherein
Q is Q-2 through Q-14,
provided that when J is J-1 or J-3 and Q is Q-2 then R_9 and R_{10} are not both H.

Preferred for reasons of more efficient weed control and/or better crop tolerance are:

1. Compound of the Formula I wherein
R_1 is CH_3;
R_2 and R_3 are CH_2CH_3 or R_2 and R_3 are taken together as -(CH_2)n- where n is 4 or 5;
R_4 is CH_3;
R_5 and R_6 are CH_3;
R_7 is CH_3 or CH_2CH_3; and
R_8 is CH_2CH_3 or $CH(CH_3)_2$.

2. The compounds of Preferred 1 wherein J is J-3.
3. The compounds of Preferred 1 wherein J is J-2.
4. The compounds of Preferred 1 wherein J is J-1.

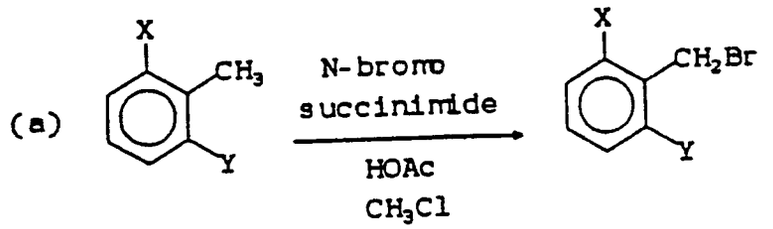
Specifically preferred compounds of the invention for reasons of most efficient weed control and/or better crop tolerance are compounds of Formula I selected from the group consisting of:
exo-1-methyl-4-(1-methylethyl)-2-[(4′-thiazolyl)methoxy]-7-oxabicyclo[2.2.1]heptane;
exo-1,4-diethyl-2-[(4′-thiazolyl)methoxy]-7-oxabicyclo[2.2.1]heptane;
exo-1-methyl-4-(1-methylethyl)-2-[(2′-(6′-fluoropyridyl))methoxy]-7-oxabicyclo[2.2.1]heptane; and
exo-1,4-diethyl-2-[(2′-(6′-fluoropyridyl))methoxy]-7-oxabicyclo[2.2.1]heptane.

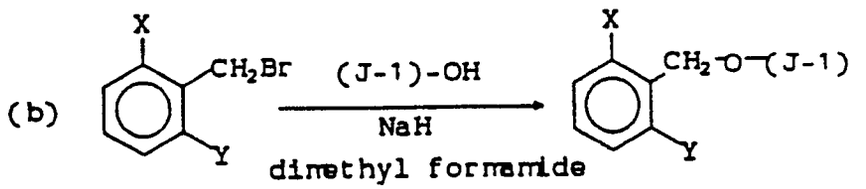
Detailed Description of the Invention

Many of the compounds of Formula I are known in the art. They can be prepared according to processes described in U.S. 4,670,041 and U.S. 4,486,219.

As an exemplification, compounds of Formula I wherein Q is Q-1 and J is J-1 can be prepared as described in Scheme 1.

Scheme 1

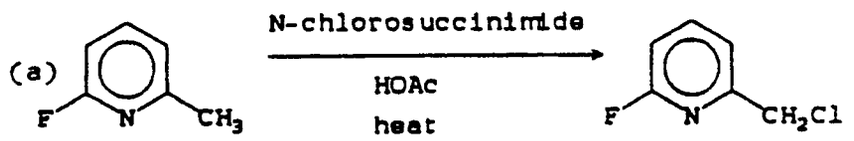


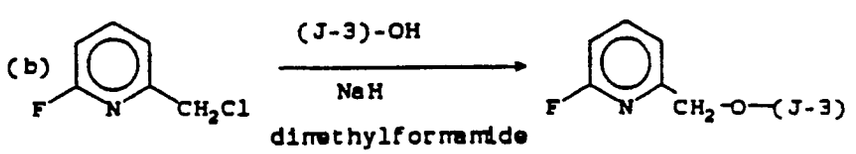


The precursor substituted toluenes can be brominated at the benzylic position as shown in Scheme 1a, and side products can be removed by purification methods (such as crystallization or chromatography) well known in the art. The substituted benzylic bromide can be coupled to the J-1 alcohol by a Williamson Ether Synthesis, effected by sodium hydride as in Scheme 1b.

Compounds of Formula I wherein Q is Q-2, Q-3 or Q-4 are prepared by a related process shown in Scheme 2 in the case of Q-2 with R_9 = H and R_{10} = F in the 6-position.

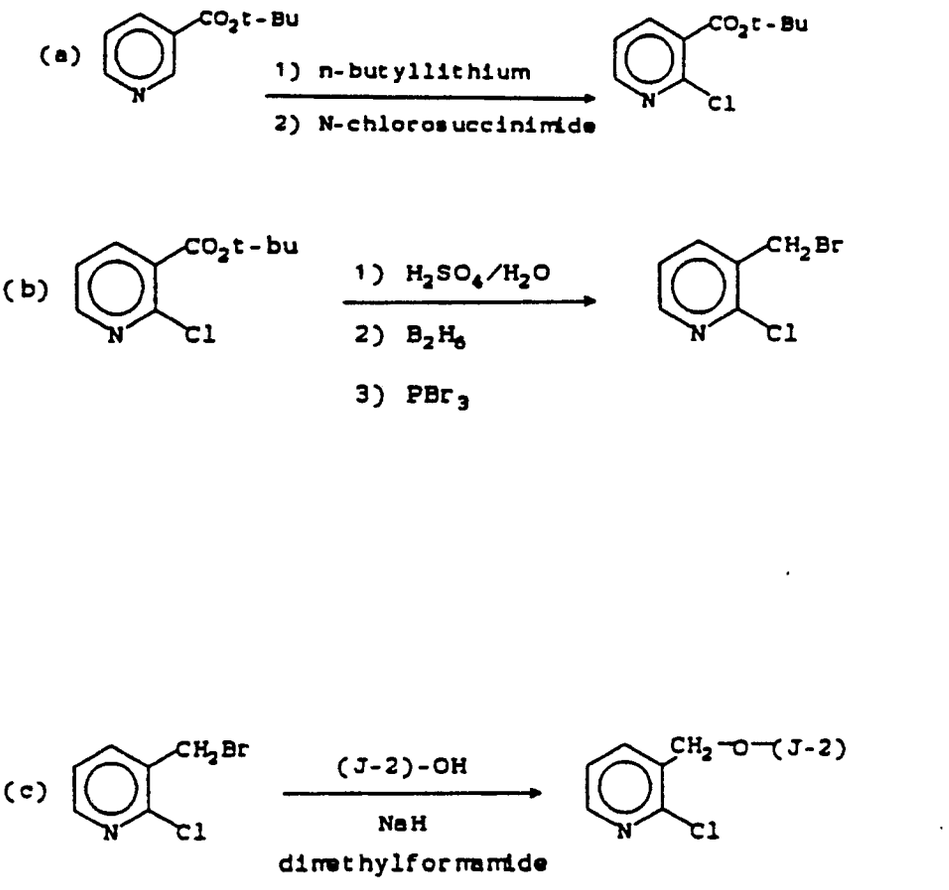
Scheme 2





An alternate synthesis of compounds of this type is shown in Scheme 3. This procedure involves metallation of a nicotinate ester and chlorination,

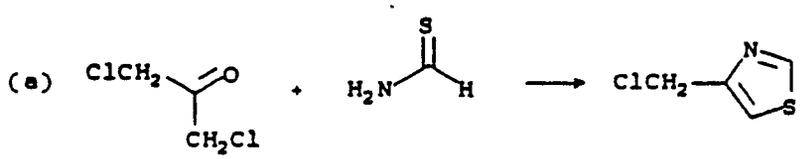
Scheme 3

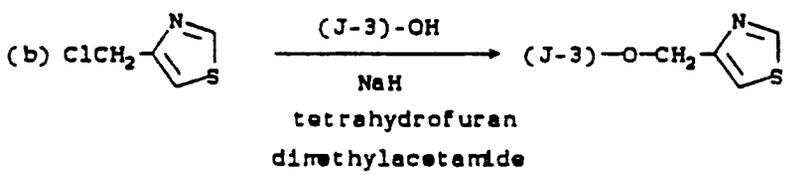


followed by acid hydrolysis, borane reduction and bromination of the resulting alcohol to furnish the substituted nicotinyl bromide, which may be coupled with a J-2 alcohol by the Williamson Ether Synthesis.

Another variant can be employed in the case of compounds of Formula I wherein Q = Q-14. This uses a Hantzsch-type synthesis as shown in Scheme 4.

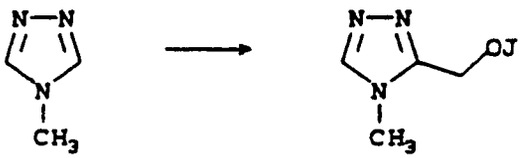
Scheme 4





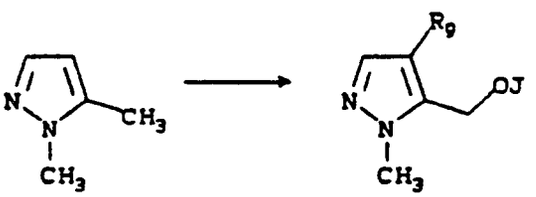
The methodology described in Schemes 1-4 is also applicable to other various Q groups as outlined in Scheme 5.

Scheme 5



3

4



5

Appropriate heterocyclic starting materials such as 3, 4 and 5 are known in the art. Analagous functional group manipulation as taught in Schemes 1-4 and applied to intermediates 3, 4 and 5 are also known in the art.

All stereoisomers (diastereomers and enantiomers); endo and exo forms; and mixtures thereof are included within the scope of the present invention.

The various individual isomeric forms and various combinations of the derivatives usually have some difference in herbicidal or plant growth control properties.

The following examples serve to illustrate the preparation of compounds of the invention.

Example 1

4-(Chloromethyl)thiazole hydrochloride

A vessel containing 44.25 mL of formamide (1.11 mol) was cooled to 0 ° C and stirred vigorously during the portionwise addition (over 1 1/2 hour) of 25.000 g of phosphorus pentasulfide (0.056 mol). When the addition was complete, 250 mL of ether was added and the suspension was stirred at room temperature overnight. The suspension was filtered, and the solids were triturated four times with 100 mL of ether. The combined ether portions were concentrated to yield 18.89 g of crude thioformamide as an orange liquid (35% yield).

This portion of crude thioformamide (0.385 mol) was dissolved in 315 mL of acetone and this was added to a solution of 31.95 g of 1,3-dichloroacetone (0.252 mol) in 126 mL of acetone. This mixture was stirred at room temperature for five days, and was then filtered to give 19.96 g of 4-(chloromethyl) thiazole hydrochloride as an off-white solid (50% yield). A small sample was neutralized for spectral characterization. Proton NMR Spectrum ($CDCl_3$, 90 MHz, ppm): 4.81 (s, 2H); 7.44 (s, 1H); 8.86 (s, 1H).

Example 2

exo-1-Methyl-4-(1-methylethyl)-2-[(4-thiazolyl)methoxyl-7-oxabicyclo[2.2.1]heptane

A stirred suspension of 7.067 g of 80% dispersion of sodium hydride in mineral oil (177 mmol) in 80 mL of dry tetrahydrofuran was charged with 6.01 g of exo-1-methyl-4-(1-methylethyl)-7-oxabicyclo[2.2.1]-heptan-2-ol (35.3 mmol). This mixture was diluted to 150 mL with additional tetrahydrofuran, and was then charged with 75 mL of dimethylacetamide followed by 5.858 g of 4-(chloromethyl)thiazole hydrochloride (37.1 mmol) and 5.268 g of sodium iodide (35.4 mmol). The reaction vessel was wrapped in aluminum foil to protect from light, and was then heated to reflux for 8 hrs, and then stirred at room temperature for 2 1/2 days. The reaction mixture was poured into a mixture of 500 mL of saturated aqueous ammonium chloride and 200 mL of water, and this was extracted four times with 60 mL of ether. The combined ether portions were extracted wtih 150 mL of brine, dried ($MgSO_4$) and concentrated to give 12.669 g of a dark brown liquid. This was purified on 250 g of silica using as eluent first 5% acetone in petroleum ether, followed by 10% and 20%, to give a major fraction of 2.962 g of exo-1-methyl-4-(1-methylethyl)-2-[(4-thiazolyl)-methoxy]-7-oxabicyclo[2.2.1]heptane as a yellow liquid (31% yield).

Proton NMR ($CDCl_3$, 90 MHz, ppm): 0.98 (d, 6H, J = 7 Hz); 1.49 (s, 3H); 1.3-1.7 (m, 4H); 1.8-2.2 (m, 3H); 3.68 (dd, 1H, J = 2.8, 6.5 Hz); 4.57 (d, 1H, J = 12 Hz); 4.78 (d, 1H, J = 12 Hz); 7.31 (fine m, 1H); 8.75 (d, 1H, J = 1.5 Hz).

Carbon NMR ($CDCl_3$, 100 MHz, ppm): 16.4, 17.9, 18.1, 31.6, 32.5, 33.7, 42.2, 66.6, 83.7, 85.2, 88.4, 114.9, 152.5, 155.3.

Example 3

exo-1,4-diethyl-2-[(4-thiazolyl)methoxy]-7-oxabicyclo[2.2.1]heptane

A stirred suspension of 361 mg of an 80% suspension of sodium hydride in mineral oil (12.0 mmol) in 4 mL of dry tetrahydrofuran was charged with a solution of 505 mg of exo-1,4-diethyl-7-oxabicyclo[2.2.1]-heptan-2-ol (2.97 mmol) in a total of 6 mL of tetrahydrofuran. This mixture was charged with 5 mL of dimethylacetamide, followed by 851 mg of 4-(chloromethyl)thiazole hydrochloride (5.38 mmol) and 445 mg of sodium iodide (2.99 mmol). The resulting mixture was heated to reflux under nitrogen for six hrs. The reaction mixture was poured into 100 mL of saturated aqueous ammonium chloride, and this was extracted

three times with 20 mL of ether. The combined ether layers were extracted with 50 mL of brine, dried ($MgSO_4$) and concentrated to give 969 mg of an orange oil. This was purified by chromatography on 30 g of silica, using as eluent 5% acetone in petroleum ether, followed by 10% and 15%, to yield 158 mg of exo-1,4-diethyl-2-[(4-thiazolyl)methoxy]-7-oxabicyclo[2.2.1]heptane as a pale yellow oil (21% yield).

Proton NMR ($CDCl_3$, 90 MHz, ppm): 0.93 (t, 3H, J = 7.5 Hz); 0.98 (t, 3H, J = 7.5 Hz); 1.3-2.3 (m, 10H); 3.75 (dd, 1H, J = 2.5, 7 Hz); 4.52 (d, 1H, J = 12 Hz); 4.73 (d, 1H, J = 12 Hz); 7.29 (fine m, 1H); 8.77 (d, 1H, J = 2.5 Hz).

Using the procedures described above, the compounds of Tables I-IV may be prepared.

TABLE I

$JOCH_2Q$				
J is J-1				
Q is Q-1				
R_1	R_2	R_3	X	Y
CH_3	CH_2CH_3	CH_2CH_3	H	2-Cl
CH_3	CH_2CH_3	CH_2CH_3	2-F	6-Cl
CH_3	CH_2CH_3	CH_2CH_3	2-F	6-F
CH_3	CH_2CH_3	CH_2CH_3	$2\text{-}CH_3$	H

TABLE II

$JOCH_2Q$				
J is J-1				
Q is Q-2				
R_9 is in the 3 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	4-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	6-F
CH_3	CH_2CH_3	CH_2CH_3	H	6-F
CH_3	cyclopentyl		H	6-F
CH_3	cyclohexyl		H	6-F

TABLE IIa

$JOCH_2Q$				
J is J-1				
Q is Q-3				
R_9 is in the 2 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	4-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	F	4-F
CH_3	CH_2CH_3	CH_2CH_3	F	4-Cl
CH_3	cyclopentyl		F	4-F
CH_3	cyclohexyl		F	4-Cl
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IIb

$JOCH_2Q$				
J is J-1				
Q is Q-4				
R_9 is in the 3 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IIc

$JOCH_2Q$				
J is J-1				
Q is Q-5				
R_9 is in the 4 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IId

$JOCH_2Q$				
J is J-1				
Q is Q-6				
R_9 is in the 3 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IIe

$JOCH_2Q$				
J is J-1				
Q is Q-7				
R_9 is in the 4 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IIf

$JOCH_2Q$			
J is J-1			
Q is Q-8			
R_9 is in the 5 position			
R_1	R_2	R_3	R_9
CH_3	CH_3	CH_3	F
CH_3	CH_3	CH_2CH_3	F
CH_3	CH_2CH_3	CH_2CH_3	F
CH_3	CH_2CH_3	CH_2CH_3	Cl
CH_3	CH_2CH_3	CH_2CH_3	Br
CH_3	CH_2CH_3	CH_2CH_3	CH_3
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3
CH_3	CH_2CH_3	CH_2CH_3	Br
CH_3	cyclopentyl		F
CH_3	cyclopentyl		Cl
CH_3	cyclopentyl		Br
CH_3	cyclopentyl		CH_3
CH_3	cyclopentyl		CH_2CH_3
CH_3	cyclohexyl		F
CH_3	cyclohexyl		Cl
CH_3	cyclohexyl		Br
CH_3	cyclohexyl		CH_3
CH_2CH_3	CH_3	CH_3	F
CH_3	CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	cyclopentyl		H
CH_3	cyclohexyl		H

TABLE IIg

$JOCH_2Q$				
J is J-1				
Q is Q-9				
R_9 is in the 4 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IIh

$JOCH_2Q$				
J is J-1				
Q is Q-10				
R_9 is in the 5 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	2-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IIi

$JOCH_2Q$				
J is J-1				
Q is Q-11				
R_9 is in the 4 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	3-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IIj

$JOCH_2Q$				
J is J-1				
Q is Q-12				
R_9 is in the 4 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE IIk

$JOCH_2Q$				
J is J-1				
Q is Q-13				
R_9 is in the 4 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	2-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE III

$JOCH_2Q$				
J is J-1				
Q is Q-14				
R_9 is in the 5 position				
R_1	R_2	R_3	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	F	H
CH_3	CH_2CH_3	CH_2CH_3	Cl	H
CH_3	CH_2CH_3	CH_2CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	Br	2-F
CH_3	cyclopentyl		F	H
CH_3	cyclopentyl		Cl	H
CH_3	cyclopentyl		Br	H
CH_3	cyclopentyl		CH_3	H
CH_3	cyclopentyl		CH_2CH_3	H
CH_3	cyclohexyl		F	H
CH_3	cyclohexyl		Cl	H
CH_3	cyclohexyl		Br	H
CH_3	cyclohexyl		CH_3	H
CH_2CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	cyclopentyl		H	H
CH_3	cyclohexyl		H	H

TABLE III

$JOCH_2Q$				
J is J-2				
Q is Q-2				
R_9 is in the 3 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	6-F
CH_3	CH_3	CH_3	H	6-F
CH_3	CH_2CH_3	CH_2CH_3	H	6-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H

TABLE IIIa

$JOCH_2Q$				
J is J-2				
Q is Q-3				
R_9 is in the 2 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	4-F
CH_3	CH_3	CH_3	F	4-F
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIIb

$JOCH_2Q$				
J is J-2				
Q is Q-4				
R_9 is in the 3 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	CH_3	CH_3	F	5-F
CH_3	CH_2CH_3	CH_2CH_3	F	5-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIIc

$JOCH_2Q$				
J is J-2				
Q is Q-5				
R_9 is in the 4 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIId

$JOCH_2Q$				
J is J-2				
Q is Q-6				
R_9 is in the 3 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIIe

$JOCH_2Q$				
J is J-2				
Q is Q-7				
R_9 is in the 4 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIIf

$JOCH_2Q$			
J is J-2			
Q is Q-8			
R_9 is in the 5 position			
R_4	R_5	R_6	R_9
CH_3	CH_3	CH_3	F
CH_3	CH_3	CH_3	Cl
CH_3	CH_3	CH_3	Br
CH_3	CH_3	CH_3	CH_3
CH_3	CH_3	CH_3	CH_2CH_3
CH_3	CH_3	CH_2CH_3	Br
CH_2CH_3	CH_3	CH_3	Br
CH_3	CH_2CH_3	CH_2CH_3	Br
CH_3	CH_3	CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	H
CH_3	CH_2CH_3	CH_2CH_3	F

TABLE IIIg

$JOCH_2Q$				
J is J-2				
Q is Q-9				
R_9 is in the 4 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	5-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIIh

$JOCH_2Q$				
J is J-2				
Q is Q-10				
R_9 is in the 5 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	3-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIIi

$JOCH_2Q$				
J is J-2				
Q is Q-11				
R_9 is in the 4 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	3-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIIj

$JOCH_2Q$				
J is J-2				
Q is Q-12				
R_9 is in the 3 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIIk

$JOCH_2Q$				
J is J-2				
Q is Q-13				
R_9 is in the 5 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	2-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IIII

$JOCH_2Q$				
J is J-2				
Q is Q-14				
R_9 is in the 5 position				
R_4	R_5	R_6	R_9	R_{10}
CH_3	CH_3	CH_3	F	H
CH_3	CH_3	CH_3	Cl	H
CH_3	CH_3	CH_3	Br	H
CH_3	CH_3	CH_3	CH_3	H
CH_3	CH_3	CH_3	CH_2CH_3	H
CH_3	CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_3	CH_3	Br	H
CH_3	CH_2CH_3	CH_2CH_3	Br	2-F
CH_3	CH_3	CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	H	H
CH_3	CH_2CH_3	CH_2CH_3	F	H

TABLE IV

$JOCH_2Q$			
J is J-3			
Q is Q-2			
R_9 is in the 3 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	5-F
CH_2CH_3	CH_2CH_3	Br	4-Cl
CH_2CH_3	CH_2CH_3	Br	5-CH_3
CH_2CH_3	CH_2CH_3	H	6-F
CH_3	$CH(CH_3)_2$	H	6-F

TABLE IVa

$JOCH_2Q$			
J is J-3			
Q is Q-3			
R_9 is in the 2 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	5-F
CH_2CH_3	CH_2CH_3	Br	4-Cl
CH_2CH_3	CH_2CH_3	Br	5-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H
CH_2CH_3	CH_2CH_3	F	4-F
CH_3	$CH(CH_3)_2$	F	4-F

TABLE IVb

$JOCH_2Q$			
J is J-3			
Q is Q-4			
R_9 is in the 3 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	5-F
CH_2CH_3	CH_2CH_3	Br	4-Cl
CH_2CH_3	CH_2CH_3	Br	5-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H
CH_2CH_3	CH_2CH_3	F	5-F
CH_3	$CH(CH_3)_2$	F	5-F

TABLE IVc

$JOCH_2Q$			
J is J-3			
Q is Q-5			
R_9 is in the 4 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	5-F
CH_2CH_3	CH_2CH_3	Br	4-Cl
CH_2CH_3	CH_2CH_3	Br	5-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H

TABLE IVd

$JOCH_2Q$			
J is J-3			
Q is Q-6			
R_9 is in the 3 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	5-F
CH_2CH_3	CH_2CH_3	Br	5-Cl
CH_2CH_3	CH_2CH_3	Br	5-CH_3
CH_3	$CH(CH_3)_2$	H	H
CH_2CH_3	CH_2CH_3	H	H

TABLE IVe

$JOCH_2Q$			
J is J-3			
Q is Q-7			
R_9 is in the 4 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	5-F
CH_2CH_3	CH_2CH_3	Br	5-Cl
CH_2CH_3	CH_2CH_3	Br	5-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H

TABLE IVf

$JOCH_2Q$		
J is J-3		
Q is Q-8		
R_9 is in the 5 position		
R_7	R_8	R_9
CH_3	CH_3	Br
CH_3	CH_2CH_3	Br
CH_3	$CH(CH_3)_2$	Br
CH_3	$CH(CH_3)_2$	F
CH_3	$CH(CH_3)_2$	Cl
CH_3	$CH(CH_3)_2$	CH_3
CH_3	$CH(CH_3)_2$	CH_2CH_3
CH_2CH_3	CH_2CH_3	F
CH_2CH_3	CH_2CH_3	Cl
CH_2CH_3	CH_2CH_3	Br
CH_2CH_3	CH_2CH_3	CH_3
CH_2CH_3	CH_2CH_3	CH_2CH_3
CH_2CH_3	CH_2CH_3	Br
CH_2CH_3	CH_2CH_3	Br
CH_2CH_3	CH_2CH_3	Br
CH_3	$CH(CH_3)_2$	H
CH_2CH_3	CH_2CH_3	H

TABLE IVg

$JOCH_2Q$			
J is J-3			
Q is Q-9			
R_9 is in the 4 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	5-F
CH_2CH_3	CH_2CH_3	Br	5-Cl
CH_2CH_3	CH_2CH_3	Br	5-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H

TABLE IVh

$JOCH_2Q$			
J is J-3			
Q is Q-10			
R_9 is in the 5 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	2-F
CH_2CH_3	CH_2CH_3	Br	2-Cl
CH_2CH_3	CH_2CH_3	Br	2-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H

TABLE IVi

$JOCH_2Q$			
J is J-3			
Q is Q-11			
R_9 is in the 4 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	2-F
CH_2CH_3	CH_2CH_3	Br	2-Cl
CH_2CH_3	CH_2CH_3	Br	2-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H

TABLE IVj

$JOCH_2Q$			
J is J-3			
Q is Q-12			
R_9 is in the 5 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H

TABLE IVk

$JOCH_2Q$			
J is J-3			
Q is Q-13			
R_9 is in the 4 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	2-F
CH_2CH_3	CH_2CH_3	Br	2-Cl
CH_2CH_3	CH_2CH_3	Br	2-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H

TABLE IVI

$JOCH_2Q$			
J is J-3			
Q is Q-14			
R_9 is in the 5 position			
R_7	R_8	R_9	R_{10}
CH_3	CH_3	Br	H
CH_3	CH_2CH_3	Br	H
CH_3	$CH(CH_3)_2$	Br	H
CH_3	$CH(CH_3)_2$	F	H
CH_3	$CH(CH_3)_2$	Cl	H
CH_3	$CH(CH_3)_2$	CH_3	H
CH_3	$CH(CH_3)_2$	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	F	H
CH_2CH_3	CH_2CH_3	Cl	H
CH_2CH_3	CH_2CH_3	Br	H
CH_2CH_3	CH_2CH_3	CH_3	H
CH_2CH_3	CH_2CH_3	CH_2CH_3	H
CH_2CH_3	CH_2CH_3	Br	2-F
CH_2CH_3	CH_2CH_3	Br	2-Cl
CH_2CH_3	CH_2CH_3	Br	2-CH_3
CH_2CH_3	CH_2CH_3	H	H
CH_3	$CH(CH_3)_2$	H	H

Formulations

The method of this invention can be conveniently carried out by formulating a compound of Formula I in the conventional ways. They include dusts, granules, pellets, solutions, suspensions, emulsions, wettable powders, emulsifiable concentrates and the like. Many of these may be applied directly. Sprayable formulations can be extended in suitable media and used at spray volumes of from a few liters to several hundred liters per hectare. High strength compositions are primarily used as intermediates for further formulation. The herbicidal formulations of the invention comprise 0.1% to 99% by weight of active ingredient(s) and at least one of (a) about 0.1% to 20% surfactant(s) and (b) about 1% to 99.9% solid or liquid inert diluent(s). More specifically, they will contain these ingredients in the following approximate proportions:

	Weight Percent*		
	Active Ingredient	Diluent(s)	Surfactant(s)
Wettable Powders	20-90	0-74	1-10
Oil Suspensions, Emulsions, Solutions, (including Emulsifiable Concentrates)	3-50	40-95	0-15
Aqueous Suspension	10-50	40-84	1-20
Dusts	1-25	70-99	0-5
Granules and Pellets	0.1-95	5-99.9	0-15
High Strength Compositions	90-99	0-10	0-2

* Active ingredient plus at least one of a Surfactant or a Diluent equals 100 weight percent.

Lower or higher levels of active ingredient can, of course, be present depending on the intended use and the physical properties of the compound. Higher ratios of surfactant to active ingredient are sometimes desirable, and are achieved by incorporation into the formulation or by tank mixing.

Typical solid diluents are described in Watkins, et al., "Handbook of Insecticide Dust Diluents and Carriers", 2nd Ed., Dorland Books, Caldwell, New Jersey, but other solids, either mined or manufactured, may be used. The more absorptive diluents are preferred for wettable powders and the denser ones for dusts. Typical liquid diluents and solvents are described in Marsden, "Solvents Guide," 2nd Ed., Interscience, New York, 1950. Solubility under 0.1% is preferred for suspension concentrates; solution concentrates are preferably stable against phase separation at 0 °C. "McCutcheon's Detergents and Emulsifiers Annual", MC Publishing Corp., Ridgewood, New Jersey, as well as Sisely and Wood, "Encyclopedia of Surface Active Agents", Chemical Publishing Co., Inc., New York, 1964, list surfactants and recommended uses. All formulations can contain minor amounts of additives to reduce foaming, caking, corrosion, microbiological growth, etc.

The methods of making such compositions are well known. Solutions are prepared by simply mixing the ingredients. Fine solid compositions are made by blending and, usually, grinding as in a hammer or fluid energy mill. Suspensions are prepared by wet milling (see, for example, Littler, U.S. Patent 3,060,084). Granules and pellets may be made by spraying the active material upon preformed granular carriers or by agglomeration techniques. See J. E. Browning, "Agglomeration", Chemical Engineering, December 4, 1967, pp. 147ff. and "Perry's Chemical Engineer's Handbook", 5th Ed., McGraw-Hill, New York, 1973, pp. 8-57ff.

For further information regarding the art of formulation, see for example:

H. M. Loux, U.S. Patent 3,235,361, February 15, 1966, Col. 6, line 16 through Col. 7, line 19 and Examples 10 through 41;

R. W. Luckenbaugh, U.S. Patent 3,309,192, March 14, 1967, Col. 5, line 43 through Col. 7, line 62 and Examples 8, 12, 15, 39, 41, 52, 53, 58, 132, 138-140, 162-164, 166, 167 and 169-182;

H. Gysin and E. Knusli, U.S. Patent 2,891,855, June 23, 1959, Col. 3, line 66 through Col. 5, line 17 and Examples 1-4;

G. C. Klingman, "Weed Control as a Science", John Wiley and Sons, Inc., New York, 1961, pp. 81-96; and

J. D. Fryer and S. A. Evans, "Weed Control Handbook", 5th Ed., Blackwell Scientific Publications, Oxford, 1968, pp. 101-103.

In the following Examples, all parts are by weight unless otherwise indicated.

Example A	
Wettable Powder	
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane	50%
sodium alkylnaphthalenesulfonate	2%
low viscosity methyl cellulose	2%
diatomaceous earth	46%

The ingredients are blended, coarsely hammer-milled and then air-milled to produce particles essentially all below 10 microns in diameter. The product is reblended before packaging.

Example B	
Granule	
Wettable Powder of Example A	5%
attapulgite granules (U.S.S. 20 to 40 mesh; 0.84-0.42 mm)	95%

A slurry of wettable powder containing 25% solids is sprayed on the surface of attapulgite granules in a double-cone blender. The granules are dried and packaged.

Example C	
Extruded Pellet	
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane	25%
anhydrous sodium sulfate	10%
crude calcium ligninsulfonate	5%
sodium alkylnaphthalenesulfonate	1%
calcium/magnesium bentonite	59%

The ingredients are blended, hammer-milled and then moistened with about 12% water. The mixture is extruded as cylinders about 3 mm diameter which are cut to produce pellets about 3 mm long. These may be used directly after drying, or the dried pellets may be crushed to pass a U.S.S. No. 20 sieve (0.84 mm openings). The granules held on a U.S.S. No. 40 sieve (0.42 mm openings) may be packaged for use and the fines recycled.

Example D	
Low Strength Granule	
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane	0.1%
attapulgite granules (U.S.S. 20 to 40 mesh)	99.9%

The active ingredient is dissolved in a solvent and the solution is sprayed upon dedusted granules in a double-cone blender. After spraying of the solution has been completed, the material is warmed to evaporate the solvent. The material is allowed to cool and then packaged.

Example E	
Low Strength Granule	
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane	1%
N,N-dimethylformamide	9%
attapulgite granules (U.S.S. 20 to 40 sieve)	90%

The active ingredient is dissolved in the solvent and the solution is sprayed upon dedusted granules in a double cone blender. After spraying of the solution has been completed, the blender is allowed to run for a short period and then the granules are packaged.

Example F	
Wettable Powder	
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane	40%
sodium ligninsulfonate	20%
montmorillonite clay	40%

The ingredients are thoroughly blended, coarsely hammer-milled and then air-milled to produce particles essentially all below 10 microns in size. The material is reblended and then packaged.

Example G	
Emulsifiable Concentrate	
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane	35%
blend of polyalcohol carboxylic esters and oil soluble petroleum sulfonates	6%
xylene	59%

The ingredients are combined and filtered to remove undissolved solids. The product can be used directly, extended with oils, or emulsified in water.

Example H	
Dust	
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane	10%
attapulgite	10%
Pyrophyllite	80%

The active ingredient is blended with attapulgite and then passed through a hammer-mill to produce particles substantially all below 200 microns. The ground concentrate is then blended with powdered pyrophyllite until homogeneous.

Example I	
Wettable Powder	
6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane	20%
sodium alkylnaphthalenesulfonate	4%
sodium ligninsulfonate	4%
low viscosity methyl cellulose	3%
attapulgite	69%

The ingredients are thoroughly blended. After grinding in a hammer-mill to produce particles essentially all below 100 microns, the material is reblended and sifted through a U.S.S. No. 50 sieve (0.3 mm opening) and packaged.

Utility

Test results indicate that compounds of this invention are active postemergence and, in particular, preemergence herbicides. Many compounds of this invention are useful for the control of selected grass and broadleaf weeds with tolerance to important agronomic crops such as barley (Hordeum vulgare), corn (Zea mays), cotton (Gossypium hirsutum), rape (Brassica napus), rice (Oryza sativa), sorghum (Sorghum bicolor), soybean (Glycine max), sugar beet (Beta vulgaris), and wheat (Triticum aestivum). Grass weeds controlled include, but are not limited to, barnyardgrass (Echinochloa crus-galli), blackgrass (Alopecurus myosuroides), crabgrass (Digitaria spp.), foxtail (Setaria spp.), and johnsongrass (Sorghum halepense). Several compounds in this invention are particularly useful for the control of barnyardgrass in upland and paddy rice. Utility in paddy rice includes both direct-seeded and transplanted paddy rice.

Several compounds in this invention have utility in non-crop areas where selected weed control is desired, such as around storage tanks, parking lots, drive-in theaters, billboards, highways, and railroad structures. These compounds are also useful in fallow areas of crop production such as in wheat and barley and in plantation crops such as palm, banana, citrus, rubber, etc. Alternatively, these compounds may be useful to modify plant growth.

The effective amount for compounds of this invention is determined by a number of factors. These

factors include: formulation selected, method of application, amount of vegetation present, growing conditions, etc. In general terms, the effective amount of the subject compounds is applied at rates from 0.01 to 20 kg/ha with a preferred rate range of from 0.02 to 1 kg/ha. One skilled in the art can easily determine rates needed for the desired level of weed control.

Compounds of this invention may be used alone or in combination with other commercial herbicides, insecticides, or fungicides. The following list exemplifies some of the herbicides suitable for use in mixtures. A combination of compounds from this invention with one or more of the following herbicides may be particularly useful for weed control.

Common Name	Chemical Name
acetochlor	2-chloro-N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl)acetamide
acifluorfen	5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoic acid
acrolein	2-propenal
alachlor	2-chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl)acetamide
anilofos	S-4-chloro-N-isopropylcarbaniloyl-methyl-O,O-dimethyl phosphorodithioate

Common Name	Chemical Name
ametryn	N-ethyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine
amitrole	1H-1,2,4-triazol-3-amine
AMS	ammonium sulfamate
asulam	methyl [(4-aminophenyl)sulfonyl]-carbamate
atrazine	6-chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
barban	4-chloro-2-butynyl 3-chlorocarbamate
benefin	N-butyl-N-ethyl-2,6-dinitro-4-(trifluoromethyl)benzenamine
bensulfuron methyl	2-[[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]methylcarbonyl]-amino]sulfonyl]methyl]benzoic acid, methyl ester
bensulide	O,O-bis(1-methylethyl) S-[2-[(phenylsulfonyl)amino]-ethyl]phosphorodithioate
bentazon	3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H)-one, 2,2-dioxide
benzofluor	N-[4-(ethylthio)-2-(trifluoromethyl)phenyl]methanesulfonamide
benzoylprop	N-benzoyl-N-(3,4-dichlorophenyl)-DL-alanine
bifenox	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate
bromacil	5-bromo-6-methyl-3-(1-methylpropyl)-2,4(1H,3H)pyrimidinedione
bromoxynil	3,5-dibromo-4-hydroxybenzonitrile

Common Name	Chemical Name
butachlor	N-(butoxymethyl)-2-chloro-N-(2,6-diethylphenyl)acetamide
buthidazole	3-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-4-hydroxy-1-methyl-2-imidazolidinone
butralin	4-(1,1-dimethylethyl)-N-(1-methylpropyl)-2,6-dinitrobenzenamine
butylate	S-ethyl bis(2-methylpropyl)-carbamothioate
cacodylic acid	dimethyl arsinic oxide
CDAA	2-chloro-N,N-di-2-propenylacetamide
CDEC	2-chloroallyl diethyldithiocarbamate
CGA 142,464	3-(4,6-dimethoxy-1,3,5-triazin-2-yl)-1-[2-(2-methoxyethoxy)-phenylsulfonyl]-urea
chloramben	3-amino-2,5-dichlorobenzoic acid
chlorbromuron	3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea
chlorimuron ethyl	2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl)ethylamino]carbonyl]-amino]sulfonyl]benzoic acid, ethyl ester
chlormethoxynil	2,4-dichlorophenyl 4-nitro-3-methoxyphenyl ether
chlornitrofen	2,4,6-trichlorophenyl-4-nitrophenyl ether
chloroxuron	N'-[4-(4-chlorophenoxy)phenyl]-N,N-dimethylurea
chlorpropham	1-methylethyl 3-chlorophenylcarbamate
chlorsulfuron	2-chloro-N-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]benzenesulfonamide

Common Name	Chemical Name
chlortoluron	N'-(3-chloro-4-methylphenyl)-N,N-dimethylurea
cinmethylin	exo-1-methyl-4-(1-methylethyl)-2-[(2-methylphenyl)methoxy]-7-oxabicyclo-[2.2.1]heptane
clethodim	(E,E)-(±)-2-[1-[[(3-chloro-2-propenyl)-oxy]imino]propyl]-5-[2-(ethylthio)-propyl]-3-hydroxy-2-cyclohexen-1-one
clomazone	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone
cloproxydim	(E,E)-2-[1-[[(3-chloro-2-propenyl)oxy)-imino]butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
clopyralid	3,6-dichloro-2-pyridinecarboxylic acid
CMA	calcium salt of MAA
cyanazine	2-[[4-chloro-6-(ethylamino)-1,3,5-tri-azin-2-yl]amino]-2-methylpropanenitrile
cycloate	S-ethyl cyclohexylethylcarbamothioate
cycluron	3-cyclooctyl-1,1-dimethylurea
cyperquat	1-methyl-4-phenylpyridinium
cyprazine	2-chloro-4-(cyclopropylamino)-6-(iso-propylamino)-s-triazine
cyprazole	N-[5-(2-chloro-1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]cyclopropanecarbox-amide
cypromid	3',4'-dichlorocyclopropanecarboxanilide
dalapon	2,2-dichloropropanoic acid
dazomet	tetrahydro-3,5-dimethyl-2H-1,3,5-thia-diazine-2-thione
DCPA	dimethyl 2,3,5,6-tetrachloro-1,4-benzene-dicarboxylate

Common Name	Chemical Name
desmediphan	ethyl [3-[[(phenylamino)carbonyl]oxy]-phenyl]carbamate
desmetryn	2-(isopropylamino)-4-(methylamino)-6-(methylthio)-s-triazine
diallate	S-(2,3-dichloro-2-propenyl)bis(1-methylethyl)carbamothioate
dicamba	3,6-dichloro-2-methoxybenzoic acid
dichlobenil	2,6-dichlorobenzonitrile
dichlorprop	(±)-2-(2,4-dichlorophenoxy)propanoic acid
dichlofop	(±)-2-[4-(2,4-dichlorophenoxy)phenoxy]-propanoic acid, methyl ester
diethatyl	N-(chloroacetyl)-N-(2,6-diethylphenyl)-glycine
difenzoquat	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium
dimepiperate	S-1-methyl-1-phenylethylpiperidine-1-carbothioate
dinitramine	N^3,N^3-diethyl-2,4-dinitro-6-(trifluoromethyl)-1,3-benzenediamine
dinoseb	2-(1-methylpropyl)-4,6-dinitrophenol
diphenamid	N,N-dimethyl-α-phenylbenzeneacetamide
dipropetryn	6-(ethylthio)-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
diquat	6,7-dihydrodipyrido[1,2-a:2',1'-c]-pyrazinedium ion
diuron	N'-(3,4-dichlorophenyl)-N,N-dimethylurea
DNOC	2-methyl-4,6-dinitrophenol
DPX-M6316	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid, methyl ester

Common Name	Chemical Name
DSMA	disodium salt of MAA
dymron	N-(4-methylphenyl)-N'-(1-methyl-1-phenylethyl)urea
endothall	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
EPTC	S-ethyl dipropylcarbamothioate
esprocarb (SC2957)	S-benzyl-N-ethyl-N-(1,2-dimethyl)-propyl)thiolcarbamate
ethalfluralin	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl)-benzenamine
ethofumesate	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate
Express®	2-[[[[N-(4-methoxy-6-methyl-1,3,5-triazine-2-yl)-N-methylamino]-carbonyl]amino]sulfonyl]benzoic acid, methyl ester
fenac	2,3,6-trichlorobenzeneacetic acid
fenoxaprop	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]-phenoxy]propanoic acid
fenuron	N,N-dimethyl-N'-phenylurea
fenuron TCA	Salt of fenuron and TCA
flamprop	N-benzoyl-N-(3-chloro-4-fluorophenyl)-DL-alanine
fluazifop	(±)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid
fluazifop-P	(R)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid
fluchloralin	N-(2-chloroethyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)benzenamine
fluometuron	N,N-dimethyl-N'-[3-(trifluoromethyl)-phenyl]urea

Common Name	Chemical Name
fluorochloridone	3-chloro-4-(chloromethyl)-1-[3-(trifluoromethyl)phenyl]-2-pyrrolidinone
fluorodifen	p-nitrophenyl α,α,α-trifluoro-2-nitro-p-tolyl ether
fluoroglycofen	carboxymethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate
fluridone	1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1H)-pyridinone
fomesafen	5-[2-chloro-4-(trifluoromethyl)phenoxy]-N-(methylsulfonyl)-2-nitrobenzamide
fosamine	ethyl hydrogen (aminocarbonyl)-phosphate
glyphosate	N-(phosphonomethyl)glycine
haloxyfop	2-[4-[[3-chloro-5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid
hexaflurate	potassium hexafluoroarsenate
hexazinone	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione
imazamethabenz	6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-m-toluic acid, methyl ester and 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-p-toluic acid, methyl ester
imazapyr	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid
imazaquin	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-quinolinecarboxylic acid
imazethapyr	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid
ioxynil	4-hydroxy-3,5-diiodobenzonitrile

Common Name	Chemical Name
isopropalin	4-(1-methylethyl)-2,6-dinitro-N,N-dipropylbenzenamine
isoproturon	N-(4-isopropylphenyl)-N',N'-dimethylurea
isouron	N'-[5-(1,1-dimethylethyl)-3-isoxazolyl]-N,N-dimethylurea
isoxaben	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dimethoxybenzamide
karbutilate	3-[[(dimethylamino)carbonyl]amino]-phenyl-(1,1-dimethylethyl)carbamate
lactofen	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate
lenacil	3-cyclohexyl-6,7-dihydro-1H-cyclopenta-pyrimidine-2,4(3H,5H)-dione
linuron	N'-(3,4-dichlorophenyl)-N-methoxy-N-methylurea
MAA	methylarsonic acid
MAMA	monoammonium salt of MAA
MCPA	(4-chloro-2-methylphenoxy)acetic acid
MCPB	4-(4-chloro-2-methylphenoxy)butanoic acid
MON 7200	S,S-dimethyl-2-(difluoromethyl)-4-(2-methylpropyl)-6-(trifluoromethyl)-3,5-pyridinedicarbothionate
mecoprop	(±)-2-(4-chloro-2-methylphenoxy)-propanoic acid
mefenacet	2-(2-benzothiazolyloxy-N-methyl-N-phenylacetamide
mefluidide	N-[2,4-dimethyl-5-[[(trifluoromethyl)-sulfonyl]amino]phenyl]acetamide
methal-propalin	N-(2-methyl-2-propenyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)benzenamide

Common Name	Chemical Name
methabenz-thiazuron	1,3-dimethyl-3-(2-benzothiazolyl)urea
metham	methylcarbamodithioic acid
methazole	2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione
methoxuron	N'-(3-chloro-4-methoxyphenyl)-N,N-dimethylurea
metolachlor	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide
metribuzin	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one
metsulfuron methyl	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]-amino]sulfonyl]benzoic acid, methyl ester
MH	1,2-dihydro-3,6-pyridazinedione
molinate	S-ethyl hexahydro-1H-azepine-1-carbothioate
monolinuron	3-(p-chlorophenyl)-1-methoxy-1-methylurea
monuron	N'-(4-chlorophenyl)-N,N-dimethylurea
monuron TCA	Salt of monuron and TCA
MSMA	monosodium salt of MAA
napropamide	N,N-diethyl-2-(1-naphthalenyloxy)-propanamide
naptalam	2-[(1-naphthalenylamino)carbonyl]-benzoic acid
neburon	1-butyl-3-(3,4-dichlorophenyl)-1-methylurea
nitralin	4-(methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline

Common Name	Chemical Name
nitrofen	2,4-dichloro-1-(4-nitrophenoxy)benzene
nitrofluorfen	2-chloro-1-(4-nitrophenoxy)-4-(trifluoromethyl)benzene
norea	N,N-dimethyl-N'-(octahydro-4,7-methano-1H-inden-5-yl)urea 3aα,-4α,5α,7α,7aα-isomer
norflurazon	4-chloro-5-(methylamino)-2-[3-(trifluoromethyl)phenyl]-3(2H)-pyridazinone
oryzalin	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide
oxadiazon	3-[2,4-dichloro-5-(1-methylethoxy)-phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2(3H)-one
oxyfluorfen	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene
paraquat	1,1'-dimethyl-4,4'-dipyridinium ion
pebulate	S-propyl butylethylcarbamothioate
pendimethalin	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine
perfluidone	1,1,1-trifluoro-N-[2-methyl-4-(phenylsulfonyl)phenyl]methanesulfonamide
phenmedipham	3-[(methoxycarbonyl)amino]phenyl (3-methylphenyl)carbamate
picloram	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid
PPG-1013	5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitroacetophenone oxime-O-acetic acid, methyl ester
pretilachlor	α-chloro-2,6-diethyl-N-(2-propoxyethyl)acetanilide

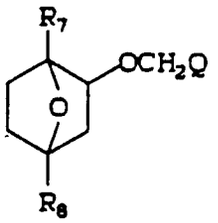
Common Name	Chemical Name
procyazine	2-[[4-chloro-6-(cyclopropylamino)-1,3,5-triazine-2-yl]amino]-2-methylpropanenitrile
profluralin	N-(cyclopropylmethyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl)benzenamine
prometon	6-methoxy-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
prometryn	N,N'-bis(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine
pronamide	3,5-dichloro-N-(1,1-dimethyl-2-propynyl)benzamide
propachlor	2-chloro-N-(1-methylethyl)-N-phenylacetamide
propanil	N-(3,4-dichlorophenyl)propanamide
propazine	6-chloro-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
propham	1-methylethyl phenylcarbamate
prosulfalin	N-[[4-(dipropylamino)-3,5-dinitrophenyl]sulfonyl]-S,S-dimethylsulfilimine
prynachlor	2-chloro-N-(1-methyl-2-propynyl)acetanilide
pyrazolate	4-(2,4-dichlorobenzoyl)-1,3-dimethylpyrazol-5-yl-p-toluenesulphonate
pyrazon	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone
pyrazosulfuron ethyl	ethyl S-[3-(4,6-dimethoxypyrimidin-2-yl)ureadosulfonyl]-1-methylpyrazole-4-carboxylate
quinclorac	3,7-dichloro-8-quinoline carboxylic acid
quizalofop ethyl	(±)-2-[4-[(6-chloro-2-quinoxalinyl)-oxy]phenoxy]propanoic acid, ethyl ester

Common Name	Chemical Name
secbumeton	N-ethyl-6-methoxy-N'-(1-methylpropyl)-1,3,5-triazine-2,4-diamine
sethoxydim	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
siduron	N-(2-methylcyclohexyl)-N'-phenylurea
simazine	6-chloro-N,N'-diethyl-1,3,5-triazine-2,4-diamine
SK-233	1-(α,α-dimethylbenzyl)-3-(4-methylphenyl)urea
sulfometuron methyl	2-[[[[(4,6-dimethyl-2-pyrimidinyl)-amino]carbonyl]amino]sulfonyl]-benzoic acid, methyl ester
TCA	trichloroacetic acid
tebuthiuron	N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea
terbacil	5-chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1H,3H)-pyrimidinedione
terbuchlor	N-(butoxymethyl)-2-chloro-N-[2-(1,1-dimethylethyl)-6-methylphenyl]-acetamide
terbuthylazine	2-(tert-butylamino)-4-chloro-6-(ethylamino)-s-triazine
terbutol	2,6-di-tert-butyl-p-tolyl methylcarbamate
terbutryn	N-(1,1-dimethylethyl)-N'-ethyl-6-(methylthio)-1,3,5-triazine-2,4-diamine
thiobencarb	S-[(4-chlorophenyl)methyl] diethylcarbamothioate
triallate	S-(2,3,3-trichloro-2-propenyl) bis(1-methylethyl)carbamothioate

Common Name	Chemical Name
triclopyr	[(3,5,6-trichloro-2-pyridinyl)-oxy]acetic acid
tridiphane	2-(3,5-dichlorophenyl)-2-(2,2,2-trichloroethyl)oxirane
trifluralin	2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)benzenamine
trimeturon	1-(p-chlorophenyl)-2,3,3-trimethylpseudourea
2,4-D	(2,4-dichlorophenoxy)acetic acid
2,4-DB	4-(2,4-dichlorophenoxy)butanoic acid
vernolate	S-propyl dipropylcarbamothioate
xylachlor	2-chloro-N-(2,3-dimethylphenyl)-N-(1-methylethyl)acetamide

Herbicidal properties of the subject compounds were discovered in a series of greenhouse tests. Test procedures and results follow.

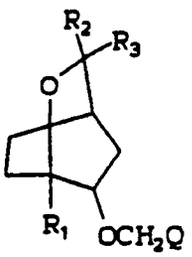
BIOLOGICAL TABLE 1



CMPD	R_7	R_8	Q
1	CH_3	$CH(CH_3)_2$	Q-3 (R_9 = 2-Br, R_{10} = H)
2	CH_3	$CH(CH_3)_2$	Q-3 (R_9 = 2-CH_3, R_{10} = H)
3	CH_3	$CH(CH_3)_2$	Q-3 (R_9 = 2-CH_2CH_3, R_{10} = H)
4	CH_3	$CH(CH_3)_2$	Q-3 (R_9 = H, R_{10} = H)
5	CH_3	$CH(CH_3)_2$	Q-14 (R_9 = H, R_{10} = H)
6	CH_3	$CH(CH_3)_2$	Q-2 (R_9 = H, R_{10} = 6-F)
7	CH_3	$CH(CH_3)_2$	Q-14 (R_9 = 2-CH_3, R_{10} = H)
8	CH_3	$CH(CH_3)_2$	Q-2 (R_9 = 6-CH_3, R_{10} = H)
9	CH_3	$CH(CH_3)_2$	Q-5 (R_9 = 4-CH_3, R_{10} = H)
10	CH_3	$CH(CH_3)_2$	Q-13 (R_9 = H, R_{10} = 4-CH_3)
11	CH_3	$CH(CH_3)_2$	Q-2 (R_9 = H, R_{10} = 6-Br)
12	CH_3	$CH(CH_3)_2$	Q-5 (R_9 = H, R_{10} = H)
13	CH_2CH_3	CH_2CH_3	Q-2 (R_9 = H, R_{10} = 6-F)
14	CH_2CH_3	CH_2CH_3	Q-2 (R_9 = H, R_{10} = 6-CH_3)
15	CH_2CH_3	CH_2CH_3	Q-14 (R_9 = H, R_{10} = H)
17	CH_3	$CH(CH_3)_2$	Q-3 (R_9 = 2-Cl, R_{10} = H)
18	CH_3	$CH(CH_3)_2$	Q-2 (R_9 = H, R_{10} = 6-Cl)

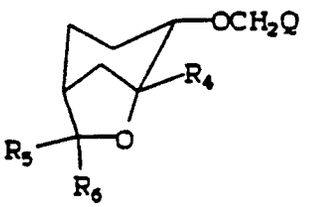
CMPD	R_7	R_8	Q
19	CH_3	$CH(CH_3)_2$	Q-3 (R_9 = H, R_{10} = 6-Cl)
20	CH_3	$CH(CH_3)_2$	Q-3 (R_9 = 2-F, R_{10} = H)
21	CH_3	$CH(CH_3)_2$	Q-4 (R_9 = 2-F, R_{10} = H)

BIOLOGICAL TABLE 2



CMPD	R_1	R_2	R_3	Q
22	CH_3	CH_2CH_3	CH_2CH_3	Q-1 (X = 2-Cl, Y = H)
23	CH_3	CH_2CH_3	CH_2CH_3	Q-1 (X = 2-F, Y = 6-F)
24	CH_3	CH_2CH_3	CH_2CH_3	Q-1 (X = 2-CH_3, Y = H)
25	CH_3	CH_2CH_3	CH_2CH_3	Q-1 (X = 2-Cl, Y = 6-F)
26	CH_3	$-(CH_2)_4-$		Q-1 (X = H, Y = H)

BIOLOGICAL TABLE 3



CMPD	R_4	R_5	R_6	Q
16	CH_3	CH_3	CH_3	Q-2 (R_9 = H, R_{10} = H)

TEST A

Seeds of barley (Hordeum vulgare), barnyardgrass (Echinochloa crus-galli), cheatgrass (Bromus secalinus), cocklebur (Xanthium pensylvanicum), corn (Zea mays), cotton (Gossypium hirsutum), crabgrass (Digitaria spp.), giant foxtail (Setaria faberi), morningglory (Ipomoea spp.), rice (Oryza sativa), sorghum (Sorghum bicolor), soybean (Glycine max), sugar beet (Beat vulgaris), velvetleaf (Abutilon theophrasti), wheat (Triticum aestivum), and wild oat (Avena fatua) and purple nutsedge (Cyperus rotundus) tubers were planted and treated preemergence with test chemicals dissolved in a non-phytotoxic solvent. At the same time, these crop and weed species were also treated with postemergence applications of test chemicals. Plants ranged in height from two to eighteen cm (two to three leaf stage) for postemergence treatments. Treated plants and controls were maintained in a greenhouse for approximately sixteen days, after which all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table A, are based on a scale of 0 to 10 where 0 is no effect and 10 is complete control. A dash (-) response means no test result.

Table A	COMPOUND
Rate (1000 g/ha)	5
POSTEMERGENCE	
Barley	8
Barnyardgrass	9
Cheatgrass	0
Cocklebur	2
Corn	9
Cotton	0
Crabgrass	9
Giant foxtail	9
Morningglory	0
Nutsedge	0
Rice	9
Sorghum	3
Soybean	2
Sugar beet	2
Velvetleaf	0
Wheat	8
Wild Oat	9

Table A	COMPOUND
Rate (1000 g/ha)	5
PREEMERGENCE	
Barley	9
Barnyardgrass	10
Cheatgrass	9
Cocklebur	3
Corn	10
Cotton	0
Crabgrass	10
Giant foxtail	10
Morningglory	0
Nutsedge	9
Rice	10
Sorghum	10
Soybean	9
Sugar beet	0
Velvetleaf	8
Wheat	10
Wild Oat	9

Table A	COMPOUND														
Rate (400 g/ha)	1	2	3	4	6	8	11	17	18	19	20	21	22	23	24
POSTEMERGENCE															
Barley	0	0	0	0	4	0	0	0	2	0	4	0	0	0	0
Barnyardgrass	7	2	1	0	8	2	0	6	8	0	9	0	5	9	2
Cheatgrass	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Cocklebur	2	1	1	0	1	1	2	2	1	0	1	0	1	1	3
Corn	2	0	0	0	7	0	0	0	5	0	6	0	0	0	0
Cotton	2	0	0	0	0	0	0	0	0	0	0	0	8	10	0
Crabgrass	7	2	2	0	2	4	2	0	2	0	0	0	9	9	4
Giant foxtail	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Morningglory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nutsedge	0	-	-	0	0	0	0	0	5	0	0	0	-	0	0
Rice	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Sorghum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soybean	0	2	3	0	1	0	0	1	0	0	0	0	0	1	0
Sugar beet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Velvetleaf	8	6	2	0	1	2	1	3	0	0	0	0	6	0	6
Wheat	0	0	0	0	3	0	0	0	0	0	5	0	0	0	0
Wild Oat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A	COMPOUND														
Rate (400 g/ha)	1	2	3	4	6	8	11	17	18	19	20	21	22	23	24
PREEMERGENCE															
Barley	0	0	0	0	2	0	0	0	1	0	6	0	0	0	0
Barnyardgrass	9	5	2	0	10	2	10	9	10	7	10	5	10	10	10
Cheatgrass	5	0	0	0	2	0	0	8	6	0	8	0	0	9	5
Cocklebur	4	0	0	0	-	0	0	0	0	0	0	0	0	0	0
Corn	2	0	0	0	5	0	0	5	8	2	7	0	3	8	3
Cotton	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass	9	9	8	8	8	7	8	9	10	2	8	0	9	10	8
Giant foxtail	9	9	9	8	9	8	9	9	10	7	10	8	9	10	9
Morningglory	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nutsedge	0	0	0	10	0	0	0	0	0	0	10	0	7	10	0
Rice	0	0	0	0	0	0	0	0	0	0	7	0	0	10	0
Sorghum	0	0	0	0	8	0	0	3	7	0	5	0	0	6	0
Soybean	0	0	0	0	0	0	0	4	0	0	2	0	0	0	0
Sugar beet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Velvetleaf	5	5	2	0	6	2	2	7	7	0	6	3	0	5	0
Wheat	3	0	0	0	5	0	0	5	3	0	7	0	0	0	0
Wild Oat	0	0	0	0	0	3	0	0	6	0	7	0	0	0	2

Table A	COMPOUND								
Rate (200 g/ha)	7	9	10	12	13	14	15	16	26
POSTEMERGENCE									
Barley	0	0	0	0	0	0	9	0	0
Barnyardgrass	5	0	2	0	0	0	9	1	0
Cheatgrass	0	0	0	0	0	0	8	0	0
Cocklebur	-	1	0	1	1	1	1	1	1
Corn	0	0	0	0	0	0	9	0	0
Cotton	0	0	0	0	0	0	2	0	0
Crabgrass	3	3	0	0	0	0	5	0	2
Giant foxtail	2	0	0	2	0	0	9	0	0
Morningglory	0	0	0	0	0	0	0	0	0
Nutsedge	0	0	0	0	0	0	0	0	0
Rice	0	0	0	3	0	0	9	0	0
Sorghum	0	0	0	0	0	0	1	0	0
Soybean	0	0	0	2	0	0	2	0	0
Sugar beet	0	0	0	1	0	0	0	0	0
Velvetleaf	0	0	1	3	0	0	2	2	0
Wheat	0	0	0	0	0	0	7	0	0
Wild Oat	0	0	0	0	0	0	4	0	0

Table A	COMPOUND								
Rate (200 g/ha)	7	9	10	12	13	14	15	16	26
PREEMERGENCE									
Barley	0	2	0	8	0	0	8	0	0
Barnyardgrass	8	7	9	8	9	0	10	7	8
Cheatgrass	7	3	2	2	5	0	10	4	2
Cocklebur	3	0	0	-	0	-	2	0	0
Corn	0	0	0	7	0	0	8	0	0
Cotton	0	0	0	0	0	0	0	0	0
Crabgrass	5	6	9	9	9	4	10	9	0
Giant foxtail	5	6	7	8	10	0	10	9	5
Morningglory	0	0	0	0	0	-	1	0	0
Nutsedge	0	-	0	0	0	0	4	0	0
Rice	0	0	0	5	0	0	9	0	0
Sorghum	0	0	0	2	7	0	7	0	0
Soybean	0	0	0	0	2	0	7	0	0
Sugar beet	0	0	0	0	0	0	1	0	0
Velvetleaf	5	3	2	3	1	-	5	1	0
Wheat	0	0	0	3	2	0	7	0	0
Wild Oat	0	0	0	0	5	0	6	0	0

Table A	COMPOUND																		
Rate (100 g/ha)	1	2	3	4	5	6	7	8	10	11	15	17	18	19	20	21	22	23	24
POSTEMERGENCE																			
Barley	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
Barnyardgrass	3	0	0	0	0	0	0	0	0	0	6	0	0	0	2	0	0	0	0
Cheatgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cocklebur	0	0	0	0	0	0	0	0	0	1	-	0	1	0	0	0	0	1	0
Corn	0	0	0	0	0	0	0	0	0	0	7	0	0	0	1	0	0	0	0
Cotton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	4	0	2
Giant foxtail	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0
Morningglory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nutsedge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
Sorghum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soybean	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Sugar beet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Velvetleaf	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
Wheat	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
Wild Oat	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0

Table A	COMPOUND																		
Rate (100 g/ha)	1	2	3	4	5	6	7	8	10	11	15	17	18	19	20	21	22	23	24
PREEMERGENCE																			
Barley	0	0	0	0	3	0	0	0	0	0	7	0	0	0	0	0	0	0	0
Barnyardgrass	8	0	0	0	7	10	0	0	4	1	10	6	9	0	7	0	9	9	9
Cheatgrass	0	0	0	0	0	0	2	0	0	8	7	0	0	0	0	0	0	3	0
Cocklebur	0	1	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Corn	0	0	0	0	2	3	0	0	0	0	6	0	0	0	2	0	0	0	0
Cotton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crabgrass	8	5	0	2	8	7	2	2	7	0	10	3	9	0	7	0	7	8	7
Giant foxtail	9	0	7	5	7	8	0	3	3	2	10	8	9	0	9	0	9	9	7
Morningglory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nutsedge	-	7	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
Rice	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0
Sorghum	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
Soybean	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Sugar beet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Velvetleaf	1	0	0	0	1	1	0	0	0	-	3	3	1	0	1	0	0	1	0
Wheat	0	0	0	0	3	0	0	0	0	0	7	0	0	0	2	0	0	0	0
Wild Oat	0	0	0	0	0	0	0	0	0	0	4	0	0	0	3	0	0	0	0

Table A	COMPOUND								
Rate (50 g/ha)	7	9	10	12	13	14	15	16	26
POSTEMERGENCE									
Barley	0	0	0	0	0	0	0	0	0
Barnyardgrass	0	0	0	0	0	0	0	0	0
Cheatgrass	0	0	0	0	0	0	0	0	0
Cocklebur	0	0	0	0	0	0	1	0	0
Corn	0	0	0	0	0	0	2	0	0
Cotton	0	0	0	0	0	0	0	0	0
Crabgrass	0	0	0	0	0	0	1	0	0
Giant foxtail	0	0	0	0	0	0	2	0	0
Morningglory	0	0	0	0	0	0	0	0	0
Nutsedge	0	0	-	-	0	0	0	0	0
Rice	0	0	0	0	0	0	0	0	0
Sorghum	0	0	0	0	0	0	0	0	0
Soybean	0	0	0	0	0	0	0	0	0
Sugar beet	0	0	0	0	0	0	0	0	0
Velvetleaf	0	0	0	3	0	0	0	0	0
Wheat	0	0	0	0	0	0	0	0	0
Wild Oat	0	0	0	0	0	0	0	0	0

Table A	COMPOUND								
Rate (50 g/ha)	7	9	10	12	13	14	15	16	26
PREEMERGENCE									
Barley	0	0	0	0	0	0	3	0	0
Barnyardgrass	0	0	2	8	9	0	10	0	0
Cheatgrass	0	0	0	0	0	0	4	0	0
Cocklebur	0	0	0	0	0	-	0	-	0
Corn	0	0	0	0	0	0	3	0	0
Cotton	0	0	0	0	0	0	0	0	0
Crabgrass	0	5	0	3	9	3	10	1	0
Giant foxtail	0	2	2	8	7	0	10	3	0
Morningglory	0	0	0	0	0	0	0	0	0
Nutsedge	0	0	-	0	0	0	0	0	0
Rice	0	0	0	1	0	0	0	0	0
Sorghum	0	0	0	2	0	0	2	0	0
Soybean	0	0	0	4	0	0	0	0	0
Sugar beet	0	0	0	0	0	0	0	0	0
Velvetleaf	0	0	0	0	0	0	1	0	0
Wheat	0	0	0	0	0	0	2	0	0
Wild Oat	0	0	0	0	0	0	2	0	0

Table A	COMPOUND	Table A	COMPOUND
Rate (20 g/ha)	5	Rate (20 g/ha)	5
POSTEMERGENCE		PREEMERGENCE	
Barley	0	Barley	0
Barnyardgrass	0	Barnyardgrass	0
Cheatgrass	0	Cheatgrass	0
Cocklebur	0	Cocklebur	0
Corn	0	Corn	0
Cotton	0	Cotton	0
Crabgrass	0	Crabgrass	0
Giant foxtail	0	Giant foxtail	0
Morningglory	0	Morningglory	0
Nutsedge	0	Nutsedge	0
Rice	0	Rice	0
Sorghum	0	Sorghum	0
Soybean	0	Soybean	0
Sugar beet	0	Sugar beet	0
Velvetleaf	0	Velvetleaf	0
Wheat	0	Wheat	0
Wild Oat	0	Wild Oat	0

TEST B

Seeds of barley (Hordeum vulgare), barnyardgrass (Echinochloa crus-galli), blackgrass (Alopecurus myosuroides), chickweed (Stellaria media), cocklebur (Xanthium pensylvanicum), corn (Zea mays), cotton (Gossypium hirsutum), crabgrass (Digitaria spp.), downy brome (Bromus tectorum), giant foxtail (Setaria faberi), green foxtail (Setaria viridis), jimsonweed (Datura stramonium), johnsongrass (Sorghum halepense), lambsquarters (Chenopodium album), morningglory (Ipomoea spp.), rape (Brassica napus), rice (Oryza sativa), sicklepod (Cassia obtusifolia), soybean (Glycine max), sugar beet (Beta vulgaris), teaweed (Sida spinosa), velvetleaf (Abutilon theophrasti), wheat (Triticum aestivum), wild buckwheat (Polygonum convolvulus), and wild oat (Avena fatua) and purple nutsedge (Cyperus rotundus) tubers were planted and treated preemergence with test chemicals dissolved in a non-phytotoxic solvent. At the same time, these crop and weed species were also treated with postemergence applications of test chemicals. Plants ranged in height from two to eighteen cm (two to three leaf stage) for postemergence treatments. Treated plants and controls wer maintained in a greenhouse for approximately 24 days, after which all species were compared to controls and visually evaluated. Plant response ratings, summarized in Table B, are reported on a 0 to 10 scale where 0 is no effect and 10 is complete control. A dash (-) response means no test result.

Table B	COMPOUND
Rate (500 g/ha)	6
PREEMERGENCE	
Barley	4
Barnyardgrass	10
Blackgrass	7
Chickweed	0
Cocklebur	3
Corn	4
Cotton	2
Crabgrass	10
Downy brome	3
Giant foxtail	10
Green foxtail	10
Jimsonweed	0
Johnsongrass	7
Morningglory	0
Nutsedge	0
Rape	2
Sicklepod	0
Soybean	0
Sugar beet	0
Teaweed	3
Velvetleaf	3
Wheat	3
Wild buckwheat	0
Wild oat	5

Table B	COMPOUND		
Rate (250 g/ha)	5	13	15
POSTEMERGENCE			
Barley	0	4	9
Barnyardgrass	0	10	10
Blackgrass	0	2	10
Chickweed	5	0	4
Cocklebur	-	3	0
Corn	0	8	5
Cotton	0	2	0
Crabgrass	7	8	6
Downy brome	0	2	9
Giant foxtail	0	6	10
Green foxtail	0	6	5
Jimsonweed	6	3	0
Johnsongrass	0	6	8
Lambsquarters	3	10	-
Morningglory	6	3	0
Nutsedge	4	0	5
Rape	0	8	0
Rice	0	3	2
Sicklepod	0	0	0
Soybean	0	3	0
Sugar beet	0	5	0
Teaweed	4	3	0
Velvetleaf	0	4	0
Wheat	0	0	9
Wild buckwheat	0	5	6
Wild oat	0	0	9

Table B	COMPOUND			
Rate (250 g/ha)	5	6	13	15
PREEMERGENCE				
Barley	0	3	5	9
Barnyardgrass	10	10	10	10
Blackgrass	0	5	10	7
Chickweed	10	0	9	7
Cocklebur	8	2	0	7
Corn	3	3	10	6
Cotton	3	0	0	6
Crabgrass	10	9	10	10
Downy brome	0	2	4	10
Giant foxtail	6	9	10	10
Green foxtail	6	9	10	10
Jimsonweed	0	0	3	4
Johnsongrass	5	5	0	9
Lambsquarters	8	-	9	-
Morningglory	0	0	0	6
Nutsedge	0	0	4	7
Rape	-	0	0	0
Rice	5	-	10	7
Sicklepod	4	0	0	5
Soybean	0	0	3	3
Sugar beet	-	0	0	4
Teaweed	8	3	6	5
Velvetleaf	5	3	8	10
Wheat	0	2	5	7
Wild buckwheat	-	0	3	7
Wild oat	-	4	10	8

Table B	COMPOUND		
Rate (125 g/ha)	5	13	15
POSTEMERGENCE			
Barley	0	2	0
Barnyardgrass	0	7	9
Blackgrass	0	2	8
Chickweed	5	0	0
Cocklebur	-	2	0
Corn	0	3	3
Cotton	0	2	0
Crabgrass	0	3	3
Downy brome	0	0	0
Giant foxtail	0	5	6
Green foxtail	0	4	1
Jimsonweed	0	3	0
Johnsongrass	0	3	5
Lambsquarters	0	3	-
Morningglory	0	0	0
Nutsedge	4	0	4
Rape	0	0	0
Rice	0	0	0
Sicklepod	0	0	0
Soybean	0	3	0
Sugar beet	0	2	0
Teaweed	0	3	0
Velvetleaf	0	2	-
Wheat	0	0	2
Wild buckwheat	0	0	0
Wild oat	0	0	2

Table B	COMPOUND		
Rate (125 g/ha)	5	13	15
PREEMERGENCE			
Barley	0	5	6
Barnyardgrass	10	10	10
Blackgrass	0	10	5
Chickweed	7	8	5
Cocklebur	3	0	3
Corn	2	0	6
Cotton	0	0	4
Crabgrass	10	10	10
Downy brome	0	4	10
Giant foxtail	5	10	10
Green foxtail	0	10	10
Jimsonweed	0	0	3
Johnsongrass	0	0	7
Lambsquarters	6	-	-
Morningglory	0	0	5
Nutsedge	-	-	5
Rape	-	0	0
Rice	3	-	4
Sicklepod	0	-	3
Soybean	0	2	2
Sugar beet	-	-	3
Teaweed	3	4	4
Velvetleaf	3	-	10
Wheat	0	3	6
Wild buckwheat	-	3	3
Wild oat	-	8	6

Table B	COMPOUND
Rate (62 g/ha)	13
POSTEMERGENCE	
Barley	0
Barnyardgrass	4
Blackgrass	0
Chickweed	0
Cocklebur	0
Corn	0
Cotton	0
Crabgrass	0
Downy brome	0
Giant foxtail	0
Green foxtail	0
Jimsonweed	0
Johnsongrass	0
Lambsquarters	3
Morningglory	0
Nutsedge	0
Rape	0
Rice	0
Sicklepod	0
Soybean	0
Sugar beet	0
Teaweed	0
Velvetleaf	0
Wheat	0
Wild buckwheat	0
Wild oat	0

Table B	COMPOUND			
Rate (62 g/ha)	5	6	13	15
PREEMERGENCE				
Barley	0	2	5	4
Barnyardgrass	10	10	10	10
Blackgrass	0	2	8	3
Chickweed	7	0	3	3
Cocklebur	-	0	0	-
Corn	2	2	0	2
Cotton	0	0	0	4
Crabgrass	8	7	10	10
Downy brome	0	0	2	5
Giant foxtail	2	7	10	10
Green foxtail	0	6	10	10
Jimsonweed	0	0	0	3
Johnsongrass	0	3	0	6
Lambsquarters	5	-	0	-
Morningglory	0	0	0	5
Nutsedge	-	0	0	4
Rape	5	0	0	0
Rice	2	2	9	3
Sicklepod	0	0	0	0
Soybean	0	0	0	2
Sugar beet	-	0	0	0
Teaweed	0	0	0	3
Velvetleaf	0	0	0	5
Wheat	0	0	0	6
Wild buckwheat	-	0	0	0
Wild oat	-	2	0	5

Table B	COMPOUND
Rate (31 g/ha)	13
POSTEMERGENCE	
Barley	0
Barnyardgrass	0
Blackgrass	0
Chickweed	0
Cocklebur	0
Corn	0
Cotton	0
Crabgrass	0
Downy brome	0
Giant foxtail	0
Green foxtail	0
Johnsongrass	0
Lambsquarters	2
Morningglory	0
Nutsedge	0
Rape	0
Rice	0
Sicklepod	0
Soybean	0
Sugar beet	0
Teaweed	0
Velvetleaf	0
Wheat	0
Wild buckwheat	0
Wild oat	0

Table B	COMPOUND			
Rate (31 g/ha)	5	6	13	15
PREEMERGENCE				
Barley	0	0	0	2
Barnyardgrass	4	8	8	10
Blackgrass	-	0	6	0
Chickweed	3	0	0	0
Cocklebur	-	0	0	3
Corn	0	-	0	0
Cotton	0	0	0	3
Crabgrass	5	3	9	9
Downy brome	0	0	0	4
Giant foxtail	0	4	7	7
Green foxtail	0	3	4	6
Jimsonweed	0	0	0	3
Johnsongrass	0	0	0	5
Lambsquarters	0	-	-	-
Morningglory	0	0	0	4
Nutsedge	0	0	0	3
Rape	5	0	0	0
Rice	0	0	2	2
Sicklepod	0	0	0	0
Soybean	0	0	0	0
Sugar beet	-	0	0	0
Teaweed	0	0	0	3
Velvetleaf	0	0	0	3
Wheat	0	0	0	3
Wild buckwheat	-	0	0	0
Wild oat	-	0	0	3

TEST C

Plastic pots were partially filled with silt loam soil. The soil was then saturated with water. Indica and Japonica rice (Oryza sativa) seedlings at the 2.0 to 2.5 leaf stage, seeds of barnyardgrass (Echinochloa crus-galli), bulrush (Scirpus mucronatus), duck salad (Heteranthera limosa), and umbrella sedge (Cyperus difformis), and tubers of arrowhead (Sagittaria spp.) and waterchestnut (Eleocharis spp.) were planted into this soil. Several days after planting, water levels were raised to 3 cm above the soil surface and maintained at this level throughout the test. Chemical treatments were formulated in a non-phytotoxic solvent and applied directly to the paddy water. Treated plants and controls were maintained in a greenhouse for approximately 21 days, after which all species were compared to controls and visually evaluated. Plant

response ratings, summarized in Table C, are reported on a 0 to 10 scale where 0 is no effect and 10 is complete control. A dash (-) response means no test result.

Table C	COMPOUND			
Rate (500 g/ha)	5	6	7	13
PADDY				
Arrowhead	0	-	0	0
Barnyardgrass	10	10	10	10
Bulrush	10	10	10	8
Duck salad	-	10	10	10
Indica rice	8	9	2	8
Japonica rice	9	7	3	9
Umbrella sedge	10	10	10	10
Waterchestnut	9	7	0	7

Table C	COMPOUND			
Rate (250 g/ha)	5	6	7	13
PADDY				
Arrowhead	0	-	0	0
Barnyardgrass	10	9	10	10
Bulrush	9	9	9	8
Duck salad	-	10	10	10
Indica rice	7	6	0	2
Japonica rice	8	4	0	7
Umbrella sedge	10	10	10	10
Waterchestnut	8	4	0	7

Table C	COMPOUND			
Rate (125 g/ha)	5	6	7	13
PADDY				
Arrowhead	0	-	0	0
Barnyardgrass	10	10	8	10
Bulrush	9	0	0	0
Duck salad	-	8	0	8
Indica rice	3	0	0	0
Japonica rice	6	0	0	0
Umbrella sedge	10	9	0	10
Waterchestnut	8	4	0	0

Table C	COMPOUND			
Rate (64 g/ha)	5	6	7	13
PADDY				
Arrowhead	0	-	0	0
Barnyardgrass	10	7	0	10
Bulrush	8	0	0	0
Duck salad	-	6	0	7
Indica rice	3	0	0	0
Japonica rice	4	0	0	0
Umbrella sedge	9	5	0	10
Waterchestnut	7	0	0	0

Table C	COMPOUND			
Rate (32 g/ha)	5	6	7	13
PADDY				
Arrowhead	0	-	0	0
Barnyardgrass	9	0	0	8
Bulrush	0	0	0	0
Duck salad	-	0	0	0
Indica rice	2	0	0	0
Japonica rice	2	0	0	0
Umbrella sedge	6	0	0	0
Waterchestnut	0	0	0	0

TEST D

This test illustrates herbicidal activity of several compounds of this invention on barnyardgrass (Echinochloa crus-galli) at two growth stages with crop safety to direct-seeded and transplanted Japonica rice (Oryza sativa).

Japonica rice (var. M202) was grown in metromix in 2-cm wide cavity trays until plants were in the three leaf stage. These seedlings were then transplanted into 10-cm diameter pots filled with silt loam soil previously flooded to a depth of 1 cm of water above the soil surface. After 3 days, the water level was then raised to a depth of 3 cm. Test compounds were applied in a non-phytotoxic solvent directly to the paddy water one day after the water level was raised to 3 cm. This 3-cm water level was maintained until test results were recorded.

For direct seeded rice, Japonica rice (var. M202) was previously germinated on moistened burlap until radicals appeared. Uniformly germinated seeds were selected and placed on the surface of a silt loam soil in 10-cm diameter pots. Sufficient water was added to keep the soil surface muddy without covering the seeds with water. One day prior to treatment, the water level was raised to 3 cm above the soil surface and maintained at this level throughout the experiment. Test chemicals, dissolved in a non-phytotoxic solvent, were applied when rice seedlings were in the 1.5 leaf stage.

Barnyardgrass seeds were mixed uniformly into silt loam soil. A 2-cm depth of this seed-soil mix was placed into 10-cm diameter pots partially filled with silt loam soil. Sufficient water was added to keep the soil muddy without flooding the soil surface. One day prior to treatment, the pots were flooded to a depth of

3 cm and maintained at this water level for the duration of the test. Test chemicals, dissolved in a non-phytotoxic solvent, were applied directly to the paddy water when the barnyardgrass was either in the 1 leaf stage or in the 2 leaf stage. Planting times for all species were scheduled so that test chemicals were applied to all plants at the same time.

Plant response ratings, shown in Table D, were recorded 14 days after application of test chemicals. These ratings are reported on a 0 to 10 scale where 0 is no injury and 10 is plant death. A dash (-) response means no test result.

Table D

PADDY	COMPOUND			
	22	23	24	25
Rate (1000 g/ha)				
Barnyardgrass (1 leaf)	10	10	10	10
Barnyardgrass (2 leaf)	10	10	10	10
Rice (direct-seeded)	2	6	7	3
Rice (transplanted)	2	3	0	0
Rate (500 g/ha)				
Barnyardgrass (1 leaf)	10	10	-	10
Barnyardgrass (2 leaf)	10	10	-	10
Rice (direct-seeded)	0	2	-	2
Rice (transplanted)	0	0	-	0
Rate (250 g/ha)				
Barnyardgrass (1 leaf)	10	10	10	10
Barnyardgrass (2 leaf)	10	10	10	9
Rice (direct-seeded)	0	0	0	0
Rice (transplanted)	0	0	0	0
Rate (100 g/ha)				
Barnyardgrass (1 leaf)	10	10	10	10
Barnyardgrass (2 leaf)	9	9	10	8
Rice (direct-seeded)	0	0	0	0
Rice (transplanted)	0	0	0	0
Rate (40 g/ha)				
Barnyardgrass (1 leaf)	7	9	5	10
Barnyardgrass (2 leaf)	4	6	6	4
Rice (direct-seeded)	0	0	0	0
Rice (transplanted)	0	0	0	0
Rate (16 g/ha)				
Barnyardgrass (1 leaf)	6	8	0	3
Barnyardgrass (2 leaf)	0	3	0	0
Rice (direct-seeded)	0	0	0	0
Rice (transplanted)	0	0	0	0

SPECTRAL DATA TABLE

CMPD	Data
4	Proton NMR ($CDCl_3$, 200 MHz, ppm): 1.0 (m, 6H), 1.4-1.6 (m, 7H), 1.9-2.2 (m, 3H), 3.58 (m, 1H), 4.5 (q, 2H), 7.26 (m, 1H), 7.7 (m, 1H), 8.55 (m, 2H).
5	Proton NMR ($CDCl_3$, 90 HMz, ppm): 0.98 (d, 6H, J = 7 Hz), 1.49 (s, 3H), 1.3-1.7 (m, 4H), 1.8-2.2 (m, 3H), 3.68 (dd, 1H, J = 2.8, 6.5 Hz), 4.57 (d, 1H, J = 12 Hz), 4.78 (d, 1H, J = 12 Hz), 7.31 (fine m, 1H), 8.75 (d, 1H, J = 1.5 Hz). Carbon NMR ($CDCl_3$, 100 mHz, ppm): 16.4, 17.9, 18.1, 31.6, 32.5, 33.7, 42.2, 66.6, 83.7, 85.2, 88.4, 114.9, 152.5, 155.3.
8	Proton NMR ($CDCl_3$, 200 MHz, ppm): 1.0 (d, 6H), 1.5 (m, 8H), 2.0 (m, 2H), 2.5 (s, 3H), 3.6 (dd, 1H), 4.59 (q, 2H), 7.0 (dd, 1H), 7.31 (d, 1H), 7.56 (t, 1H).
13	Infrared (neat): 2990, 1605, 1580, 1430, 1110, 920 (broad), 790, 710 cm^{-1}.
14	Proton NMR ($CDCl_3$, 200 MHz, ppm): 0.95 (t, 6H), 1.3-2.3 (m, 10H), 2.5 (s, 3H), 3.7 (dd, 1H), 4.5 (q, 2H), 7.0 (d, 1H), 7.4 (d, 1H), 7.55 (t, 1H). Infrared (neat): 2980, 1590, 1580, 1455, 1100 (broad), 780, 710, cm^{-1}.
15	Proton NMR ($CDCl_3$, 90 MHz, ppm): 0.93 (t, 3H, J = 7.5 Hz), 0.98 (t, 3H, J = 7.5 Hz), 1.3-2.3 (m, 10H), 3.75 (dd, 1H, J = 2.5, 7 Hz), 4.52 (d, 1H, J = 12 Hz), 4.73 (d, 1H, J = 12 Hz), 7.29 (fine m, 1H), 8.77 (d, 1H, J = 2.5 Hz).

CMPD	Data
16	Proton NMR ($CDCl_3$, 200 MHz, ppm): 1.1-1.6 (m, 11H), 1.8 (m, 3H), 1.9-2.2 (m, 2H), 3.2 (dd, 1H), 4.6 (q, 2H), 7.1 (dd, 1H), 7.5-7.7 (m, 2H), 8.45 (dd, 1H). Infrared (neat): 2970, 1590, 1580, 1450, 1430, 1360, 1100, 960, 750, 720 cm^{-1}.

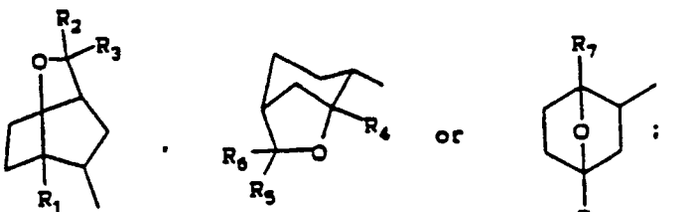
Claims

1. A method for controlling the growth of undesired vegetation in a paddy rice crop by applying to the locus of the paddy rice crop an effective amount of a compound of Formula I

$JOCH_2Q$ Formula I

wherein

J is



J-1 J-2 J-3

R_1 is CH_3 or CH_2CH_3;

R_2 and R_3 are independently H, CH_3 or CH_2CH_3 or

R_2 and R_3 may be taken together as -(CH_2)n- where n is 4 or 5;

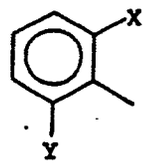
R_4 is H, CH_3 or CH_2CH_3;

R_5 and R_6 are independently CH_3 or CH_2CH_3;

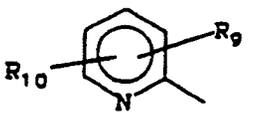
R_7 is CH_3 or CH_2CH_3;

R_8 is CH_3, CH_2CH_3 or $CH(CH_3)_2$;

Q is



Q-1



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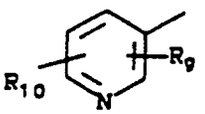
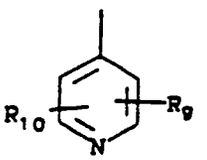
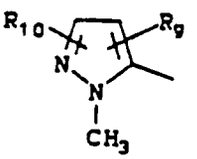


Q-3



Q-4



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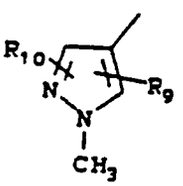

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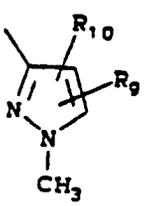

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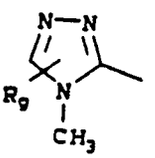
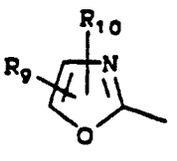
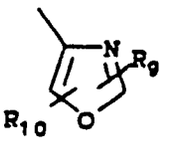


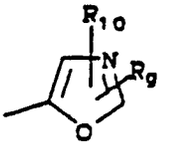
Q-8



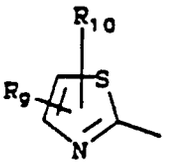
Q-9



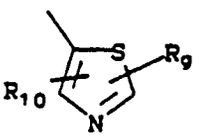
Q-10



Q-11

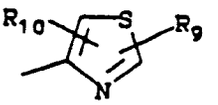


Q-12



Q-13

or



Q-14

X is F, Cl, or CH_3;
Y is H, F, or Cl;
R_9 is H, F, Cl, Br, CH_3 or CH_2CH_3; and
R_{10} is H, F, Cl or CH_3;
provided that

(1) when J is J-1 or J-3 and Q is Q-2 then R_9 and R_{10} are not both H,
(2) when Q is Q-1 then J is J-1, R_1 is CH_3, and R_2 and R_3 are both CH_2CH_3,
(3) when X is F then Y is other than H,
(4) when X is Cl then Y is other than Cl,
(5) when X is CH_3 then Y is H,
(6) when Y is H then X is Cl or CH_3,
(7) when Y is F then X is F or Cl, and
(8) when Y is Cl then X is F or H.

2. The method of Claim 1 wherein:
R_1 is CH_3;
R_2 and R_3 are CH_2CH_3 or R_2 and R_3 are taken together as $-(CH_2)_n-$ where n is 4 or 5;
R_4 is CH_3;
R_5 and R_6 are CH_3;
R_7 is CH_3 or CH_2CH_3; and
R_8 is CH_2CH_3 or $CH(CH_3)_2$.

3. The method of Claim 2 wherein J is J-1.

4. The method of Claim 2 wherein Q is Q-1.

5. The method of Claim 2 wherein the crop is transplanted japonica rice.

6. The method of Claim 2 wherein the crop is transplanted indica rice.

7. The method of Claim 2 wherein among the weeds controlled is barnyardgrass.

8. The method of Claim 1 wherein the compound of Formula I is 6-endo-[(2,6-difluorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane.

9. The method of Claim 1 wherein the compound of Formula I is 6-endo-[(2-chlorophenyl)methoxy]-3,3-diethyl-1-methyl-2-oxabicyclo[2.2.2]octane.

10. The method of Claim 1 wherein the compound of Formula I is 6-endo-[(2-chloro-6-fluorophenyl)-methoxy]-3,3-diethyl-1methyl-2-oxabicyclo[2.2.2.]octane.

11. The method of Claim 1 wherein the compound of Formula I is 3,3-diethyl-1-methyl-6-endo-[(2-

methylphenyl)methoxy]-2-oxabicyclo[2.2.2]octane.

12. The method of Claim 1 wherein the compound of Formula I is exo-1-methyl-4-(1-methylethyl)-2-[(4′-thiazolyl)methoxy]-7-oxabicylco[2.2.1]heptane.

13. The method of Claim 1 wherein the compound of Formula I is exo-1,4-diethyl-2-[(4′-thiazolyl)-methoxy]-7-oxabicyclo[2.2.1]heptane.

14. The method of Claim 1 wherein the compound of Formula I is exo-1-methyl-4-(1-methylethyl)-2-[(2′-(6′-fluoropyridyl))methoxy]-7-oxabicyclo[2.2.1]heptane.

15. The method of Claim 1 wherein the compound of Formula I is exo-1,4-diethyl-2-[(2′-(6′-fluoropyridyl))-methoxy]-7-oxabicyclo[2.2.1]heptane.

16. Compounds of Claim 1 of Formula I wherein Q is Q-2 through Q-14, provided that when J is J-1 or J-3 and Q is Q-2 then R_9 and R_{10} are not both H.

17. Compounds of Claim 16 of Formula I wherein

R_1 is CH_3;

R_2 and R_3 are CH_2CH_3 or R_2 and R_3 are taken together as $-(CH_2)_n-$ where n is 4 or 5;

R_4 is CH_3;

R_5 and R_6 are CH_3;

R_7 is CH_3 or CH_2CH_3; and

R_8 is CH_2CH_3 or $CH(CH_3)_2$.

18. Compounds of Claim 17 wherein J is J-3.

19. Compounds of Claim 17 wherein J is J-2.

20. Compounds of Claim 17 wherein J is J-1.

21. The compound of Claim 17 which is exo-1-methyl-4-(1-methylethyl)-2-[(4′-thiazolyl)methoxy]-7-oxabicyclo[2.2.1]heptane.

22. The compound of Claim 14 which is exo-1,4-diethyl--2-[(4′-thiazolyl)methoxy]-7-oxabicyclo[2.2.1]-heptane.

23. The compound of Claim 14 which is exo-1-methyl-4-(1-methylethyl)-2-[(2′-(6′-fluoropyridyl)-)methoxy]-7-oxabicyclo[2.2.1]heptane.

24. The compound of Claim 14 which is exo-1,4-diethyl-2-[(2′-(6′-fluoropyridyl))methoxy]-7-oxabicyclo-[2.2.1]heptane.

25. An agriculturally suitable composition for controlling the growth of undesired vegetation comprising an effective amount of the compound of Claim 16 and at least one of the following:
surfactant, solid diluent or liquid diluent.

26. An agriculturally suitable composition for controlling the growth of undesired vegetation comprising an effective amount of the compound of Claim 17 and at least one of the following:
surfactant, solid diluent or liquid diluent.

27. An agriculturally suitable composition for controlling the growth of undesired vegetation comprising an effective amount of the compound of Claim 18 and at least one of the following:
surfactant, solid diluent or liquid diluent.

28. An agriculturally suitable composition for controlling the growth of undesired vegetation comprising an effective amount of the compound of Claim 21 and at least one of the following:
surfactant, solid diluent or liquid diluent.

29. An agriculturally suitable composition for controlling the growth of undesired vegetation comprising an effective amount of the compound of Claim 22 and at least one of the following:
surfactant, solid diluent or liquid diluent.

30. An agriculturally suitable composition for controlling the growth of undesired vegetation comprising an effective amount of the compound of Claim 23 and at least one of the following:
surfactant, solid diluent or liquid diluent.

31. An agriculturally suitable composition for controlling the growth of undesired vegetation comprising an effective amount of the compound of Claim 24 and at least one of the following:
surfactant, solid diluent or liquid diluent.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 2693

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,X	US-A-4 798 621 (DU PONT) * Claim 1 * ---	1	C 07 D 493/08 C 07 D 405/12 C 07 D 413/12 C 07 D 417/12 A 01 N 43/90 A 01 N 43/40 A 01 N 43/56 A 01 N 43/653 A 01 N 43/76 A 01 N 43/78
X	CHEMICAL ABSTRACTS, vol. 110, 1989, page 264, abstract no. 110124r, Columbus, Ohio, US; & JP-A-63 165 301 (SHELL KAGAKU K.K.) 08-07-1988 * Abstract * ---	1	
D,X	US-A-4 486 219 (SHELL) * Claims 1,9 * ---	1	
D,X	EP-A-0 081 893 (SHELL) * Claims 1,23 * & US-A-4 670 041 ---	16,25	
X	GB-A-2 188 931 (SHELL) * Claims 1,13 * ---	16,25	
P,X	EP-A-0 308 170 (DU PONT)(22-03-1989) * Claim 1 * -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

C 07 D 493/00
C 07 D 405/00
C 07 D 413/00
C 07 D 417/00
A 01 N 43/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29-05-1990	ALFARO I.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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